Volunteer Lake Assessment Program Individual Lake Reports

HIGHLAND LAKE, ANDOVER, NH

MORPHOMETRIC DATA

Watershed Area (Ac.):	3,264	**Max. Depth (m):**	13.4	**Flushing Rate (yr^{1}):**	1.5
Surface Area (Ac.):	211	**Mean Depth (m):**	5	**P Retention Coef:**	0.59
Shore Length (m):	4,700	**Volume (m^{3}):**	4,278,500	**Elevation (ft):**	645

TROPHIC CLASSIFICATION

Year	Trophic class
1978	MESOTROPHIC
1994	MESOTROPHIC

KNOWN EXOTIC SPECIES

The Waterbody Report Card tables are generated from the DRAFT 2014 305(b) report on the status of N.H. waters, and are based on data collected from 2004-2013. Detailed waterbody assessment and report card information can be found at www.des.nh.gov/organizations/divisions/water/wmb/swqa/index.htm

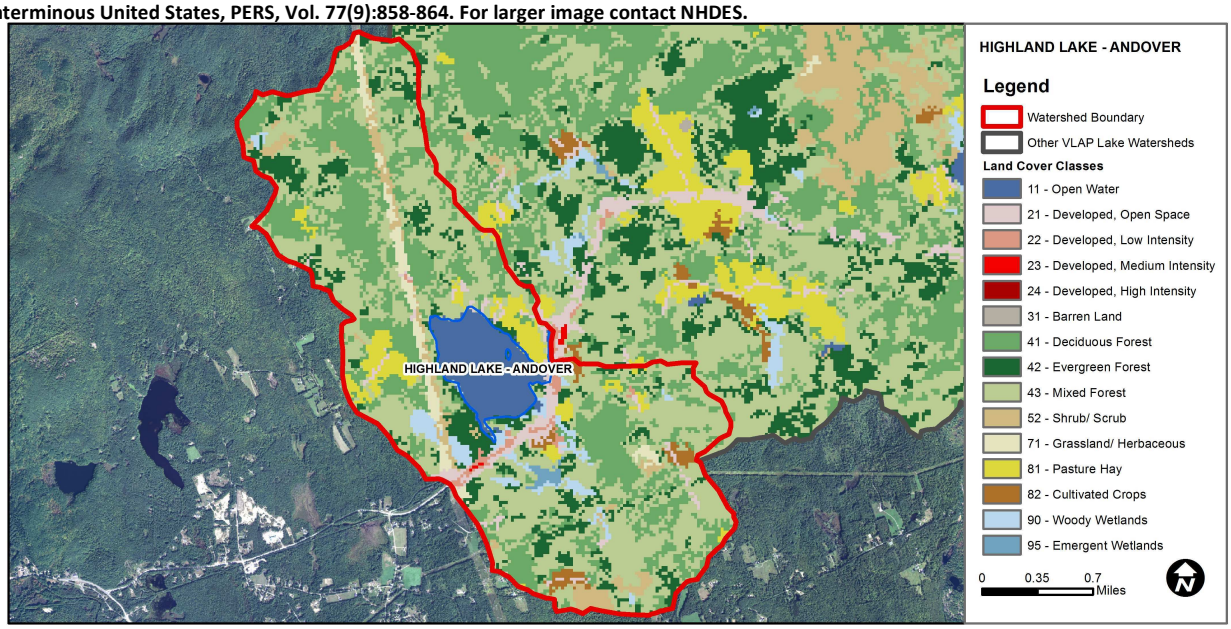
Designated Use	Parameter	Category	Comments
Aquatic Life	Phosphorus (Total)	Good	The calculated median is from 5 or more samples and is < indicator and > 1/2 indicator and the chlorophyll a indicator is okay.
	pH	Slightly Bad	>10% of samples exceed criteria by a small margin (minimum of 2 exceedances).
	Oxygen, Dissolved	Encouraging	There are < 10 samples with 0 exceedances of criteria. More data needed.
	Dissolved oxygen satura	Cautionary	There are < 10 samples with 1 exceedance of criteria. More data needed.
	Chlorophyll-a	Good	The calculated median is from 5 or more samples and is < indicator and > 1/2 indicator.
Primary Contact Recreation	Escherichia coli	Very Good	Where there are no geometric means, all bacteria samples are < 75% of the geometric mean. Where there are geometric means all single bacteria samples are < the SSMC and all geometric means are < geometric mean criteria.
	Chlorophyll-a	Very Good	There are a total of at least 10 samples with 0 exceedances of indicator.

BEACH PRIMARY CONTACT ASSESSMENT STATUS

HIGHLAND LAKE - TOWN BEACH	Escherichia coli	Very Good	Where there are no geometric means, all bacteria samples are < 75% of the geometric mean. Where there are geometric means all single bacteria samples are < the SSMC and all geometric means are < geometric mean criteria.

WATERSHED LAND USE SUMMARY

Fry, J., Xian, G., Jin, S., Dewitz, J., Homer, C., Yang, L., Barnes, C., Herold, N., and Wickham, J., 2011. Completion of the 2006 National Land Cover Database for the Conterminous United States, PERS, Vol. 77(9):858-864. For larger image contact NHDES.



Land Cover Category	% Cover	Land Cover Category	% Cover	Land Cover Category	% Cover
Open Water	6.48	Barren Land	0	Grassland/Herbaceous	2.66
Developed-Open Space	2.72	Deciduous Forest	25.65	Pasture Hay	4.23
Developed-Low Intensity	0.84	Evergreen Forest	9.65	Cultivated Crops	1.04
Developed-Medium Intensity	0.03	Mixed Forest	40.23	Woody Wetlands	2.57
Developed-High Intensity	0	Shrub-Scrub	3.56	Emergent Wetlands	0.4

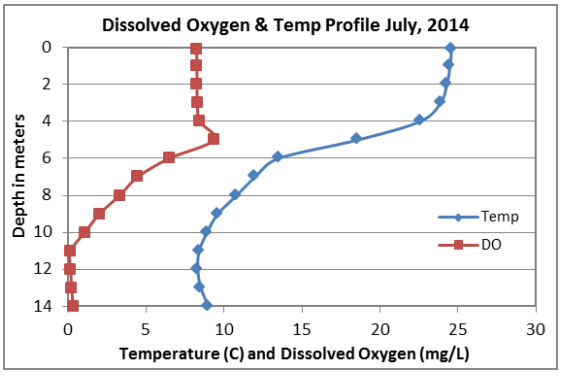
Volunteer Lake Assessment Program Individual Lake Reports

Highland Lake, Andover

2014 Data Summary

Observations and Recommendations (*Refer to Table 1 and Historical Deep Spot Data Graphics)*

- **Chlorophyll-a:** Chlorophyll levels decreased slightly from June to July, increased in August, and then decreased to low levels in September. Average chlorophyll level was low and less than the state median. Historical trend analysis indicates stable chlorophyll levels since monitoring began.
- **Conductivity/Chloride:** Deep spot and tributary conductivity and chloride levels were average for NH lakes and generally equal to the state medians. Historical trend analysis indicates stable epilimnetic (upper water layer) conductivity since monitoring began.
- **Total Phosphorus:** Epilimnetic phosphorus remained stable and low on each sampling event and historical trend analysis indicates relatively stable epilimnetic phosphorus with moderate variability between years. Metalimnetic (middle water layer) phosphorus was low and fluctuated from June to September. Hypolimnetic (lower water layer) phosphorus was within an average range but increased slightly as the summer progressed and with increasing turbidity levels. Lower Maple St. Bk. phosphorus was elevated in June following a significant storm event. West Inlet phosphorus was slightly elevated in July and August likely due to wetland influences. All other tributary phosphorus levels were within average ranges for those stations.
- **Transparency:** Transparency was stable from June through September, and better than the state median. Average transparency was the best measured since monitoring began; we hope to see this continue! Historical trend analysis indicates relatively stable transparency with moderate variability between years.
- **Turbidity:** Epilimnetic and metalimnetic turbidities were low on each sampling event. Hypolimnetic turbidity was slightly elevated in June and September and greatly elevated in July and August. Lower Maple St. Bk. turbidity was elevated in July following a significant storm event. Outlet turbidity was generally elevated and above average on each sampling event, particularly in June. West Inlet turbidity was slightly elevated July through September.
- **pH:** Epilimnetic pH levels were within the desirable range of 6.5—8.0 units, however metalimnetic pH fluctuates below 6.5 units and hypolimnetic pH levels were consistently below 6.5 units. Historical trend analysis indicates relatively stable epilimnetic pH with moderate variability between years. Tributary pH levels were within a desirable range.
- **Recommended Actions:** The stable water quality trends are a great sign indicating that potential pressures in the watershed are not negatively impacting water quality in the long term. However, short-term negative water quality impacts may still be present. Periodically, following storm events, tributary phosphorus and/or turbidity levels have been elevated and the increased intensity and frequency of storm events highlights the importance of managing stormwater runoff in the watershed. DES' "NH Homeowner's Guide to Stormwater Management" is a great resource for homeowners. Keep up the great work!



NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.
Chloride: > 230 mg/L (chronic)
E. coli: > 88 cts/100 mL – public beach
E. coli: > 406 cts/100 mL – surface waters
Turbidity: > 10 NTU above natural level
pH: between 6.5-8.0 (unless naturally occurring)

NH Median Values: Median values for specific parameters generated from historic lake monitoring data.
Alkalinity: 4.9 mg/L
Chlorophyll-a: 4.58 mg/m^3
Conductivity: 40.0 uS/cm
Chloride: 4 mg/L
Total Phosphorus: 12 ug/L
Transparency: 3.2 m
pH: 6.6

Station Name	Table 1. 2014 Average Water Quality Data for HIGHLAND LAKE								
	Alk. mg/l	Chlor-a ug/l	Chloride mg/l	Cond. uS/cm	Total P ug/l	Trans. m		Turb. ntu	pH
						NVS	VS		
Epilimnion	6.13	3.10	4	39.6	5	5.60	5.31	0.77	6.91
Metalimnion				39.2	10			1.55	6.60
Hypolimnion				46.5	13			14.46	6.35
Lower Maple St Brook				33.9	12			1.72	6.91
Outlet				44.4	10			3.15	6.76
Tilton Brook				28.3	11			1.12	6.90
West Inlet			6	63.1	20			2.38	6.56

Historical Water Quality Trend Analysis

Parameter	Trend	Explanation	Parameter	Trend	Explanation
Conductivity	Stable	Trend not significant; data show low variability.	Chlorophyll-a	Stable	Trend not significant; data show low variability.
pH (epilimnion)	Stable	Trend not significant; data moderately variable.	Transparency	Stable	Trend not significant; data moderately variable.
			Phosphorus (epilimnion)	Stable	Trend not significant; data moderately variable.